REMARKS

This Amendment is in reply to a non-final Office Action mailed October 7, 2008. Claims 1, 3-9, 11-16, and 19-24 are pending in the application, with claims 4-8 and 12-16 withdrawn from consideration. Claims 1, 3, 9 and 11 stand rejected under 35 U.S.C. §103(a). Claims 19-24 stand rejected under 35 U.S.C. §112, first and second paragraphs. In response, applicants have amended claims 1 and 9 to incorporate the limitations of claims 3 and 11, cancelled claims 3 and 11, and have amended claims 19, 20, 22 and 23. No new material has been added by way of these amendments. The Commissioner is hereby authorized to charge deposit account 02-1818 for any fees which are due and owing.

In the Office Action, claims 19 and 22 are rejected under §112, first paragraph, for failing to comply with written description requirement and enablement, and §112, second paragraph, as being indefinite. Claims 20-21 and 23-24 are rejected under §112, second paragraph, as being indefinite. In response, claims 19 and 22 have been amended to include the limitation "by mass" to indicate the type of ratio encompassed, and claims 20 and 23 have been amended to include a lower limitation. These amendments should cure the §112 second paragraph rejections listed as item 6 on pages 3-4 of the Office Action.

More generally, claims 19 through 24 were added in the previous Office Action to provide specific claim limitations based on experiments that were presented in the application, and that are set forth in Tables 1 and 2 of the instant application. Claims 19 through 24, which depend from claims 1 and 9, provide claim limitations drawn specifically to results presented within the application. Claims 19 and 22 recite the ratio of styrene-butadiene-latex adhesive to polyacrylic acid between 0.8:1 to 4:1 by mass. Support for these limitations are drawn directly from the Experimental Section. Specifically, the 0.8:1 limitation is drawn directly from Example 2-2 in Table 2 – the SBR to PAA mass ratio is 2:2.5, which is equal to 0.8:1. Similarly, support of the 4:1 by mass is drawn directly from Example 1-2 in Table 1 and Example 2-1 in Table 2. In between these points can also be found Examples 1-1 at the ratio of 2:1 by mass of SBR to PAA. In addition, the Examiner asserts that "at the largest %weight of butadiene [of] 4 % wt., the ratios 0.8:1 to 4:1 do not describe this amount in contrast to the thickener." Item 4, page 3 of non-final Office Action, October 7, 2008. Applicants are unclear as to what information is not present – at 4% SBR, the 4:1 ratio gives 1 wt% PAA, well within the limitations of claim 1.

Admittedly, as the weight ratio of SBR to PAA shifts from 4:1 to 0.8:1, a 4 wt% SBR becomes problematic, but that is basically the main point of the additional limitation in claims 19 and 22 (as well as 20, 21, 23 and 24.) The weight percentages of SBR and PAA in claims 1 and 9 are stated independently in terms of percent weight for each compound in the cathode mixture layer. In dependent claims 19 and 22, the weight ratios of SBR and PAA are further limited by requiring the two components to maintain a specific weight ratio between themselves.

Claim 20 and 23 recite the limitation that the SBR and PAA represent greater than 2.3 weight % and less than 6% weight of the cathode mixture layer, while claims 21 and 24 further narrow this limitation to between about 2.5% to about 5% weight of the cathode mixture layer. Each set of these claims represents a limitation to independent claims 1 and 9. In claims 20 and 23, the combined amount of SBR and PAA is less than 6% based on Comparative Example 1-2, but more than 2.3% based on Comparative Example 2-1 (2.3 weight % total binder is insufficient) further supported by Comparative Example 1-1 (2 weight percent also is insufficient). In claims 21 and 24, the range of total binder is between about 2.5% and about 5% based on Examples 1-1, 1-2, 2-1, and 2-2. As in the discussion of claims 19 and 22 above, the weight percentages of SBR and PAA in claims 1 and 9 are stated independently in terms of percent weight for each compound in the cathode mixture layer, and dependent claims 20, 21, 23, and 24 further limit the scope as defined by these claim limitations to require that SBR and PAA maintain a specific total combined weight percentage of the cathode mixture.

In the Office Action, claims 1, 3, 9, 11, and 19-24 are rejected under §103(a) as being unpatentable over U.S. Patent No. 6,632,566 ("Yamada") in view of U.S. Patent No. 5,631,100 ("Yoshino.") Independent claims 1 and 9 contain parallel language requiring a cathode mixture layer that contains a cathode active material and a binder including a styrene butadiene latex adhesive (hereinafter "SBR") and a thickener. The content of the SBR in the cathode mixture layer ranges from between about 2 wt% to about 4 wt%, and the content of the thickener in the cathode mixture layer ranges between about 0.5 wt% to about 2.5 wt%. The thickener is polyacrylic acid (hereinafter "PAA") and the cathode active material is lithium iron phosphorous oxide ($LiFePO_4$) having an olivinic structure. Claims 3 and 11, which depend from claims 1 and 9 respectively, require the further limitation that the cathode mixture layer contains a carbon material as a conductive agent, wherein the carbon material ranges from 5 wt% to 12 wt% with

respect to the total amount of cathode active material and carbon material. Newly added claims 19-24 recite a specific ratio of SBR to PAA, and specific limitations on the total amount of SBR and PAA in the cathode mixture layer.

In Yamada the only support for adding carbon to the cathode mixture layer can be found at col. 10 lns. 11-12, where 25% weight acetylene black is added to $LiFePO_4$ with PVDF as a binder. In Yoshino, no discussion is present in the specification for including a conductive agent that is carbon in the cathode. In Example 1 of Yoshino, a cathode containing a lithium oxide and a pair of carbon agents is disclosed. However, first, that example contains PVDF as a binder with no thickener. Second, the binder is not greater than 2% weight of the cathode mixture layer (2 parts/(100+2.5+2.5+2) total parts = 1.87%). And third, the percent weight of carbon with respect to the total amount of cathode active material and carbon material is 4.76% (5 parts/105 total parts), which is outside the claimed range of 5-12%. Consequently, the combination of Yoshino and Yamada fails to disclose a cathode mixture layer containing olivinic $LiFePO_4$, 2-4% by weight SBR, 0.5-2.5% by weight PAA, and a carbon material as a conducting agent in 5-12% by weight with respect to the cathode active material and the carbon material. In response to this argument, Examiner asserts that the Applicant is using "examples conveniently outside of the claimed range, but that because Yoshino references discloses 'the present invention will be illustrated with reference to Examples, which, however, should not be construes as limiting the invention (12:40-50)."

This assertion fails for several reasons. First, while it is generally true that citing an example will not defeat the broader disclosure of a reference for prior art purposes, the reference must provide support for the limitation that it is being asserted against. In this instance, the limitation missing in the reference is the presence of carbon in a cathode with SBR:PAA. The Examiner has not indicated, nor is there in fact any place in the specification, where carbon is being included in the cathode with the single exception of Example 1. Second, the phrase quoted by Yoshino does support the premise that an invention or disclosure would not be limited to it's Examples; however, the specification must provide support for the limitation. Yoshino does not. It merely states a cathode can be prepared containing 5 parts carbon to 100 parts cathode active material and 2 parts of fluoropolymer. No other information regarding carbon is present in Yoshino, so the rejection based on carbon content in Yoshino should be withdrawn.

Applicant previously added new dependent claims 19-24 which the Applicant views as further defining the claimed invention as compared to the prior art. However, due to the Examiner's §112 rejection in the previous office action, claims 19-24 seem to have been interpreted as coequal with claims 1 and 9. Claims 19-24 are narrower embodiments of the claimed invention. Specifically, these limitations focus on specific ranges of binder that worked in the Examples set forth in the Applicant's specification, as compared to ranges of SBR and PAA that failed. The Examiner's attention is directed to the Examples of the instant specification. Examples 1 and 2 make clear that cathodes succeed in only a very narrow range of binder and thickener concentrations when prepared with SBR, PAA and olivinic lithium iron phosphorous oxide. The SBR to PAA ratio must be between 0.8:1 to 4:1, and the amount of SBR and PAA present cannot be more than 6% of the weight of the cathode mixture layer, more preferably between 2.5-5% weight of the cathode mixture layer. Surprisingly, as the amount of binder is reduced to within these ranges, the cathodes of the claimed invention exhibit high strength layers with sufficient binding force. Furthermore, even when the total amount of binder is decreased, excellent cycle characteristics with improved high load discharge capacity are exhibited.

Applicants respectfully request consideration of these narrower embodiments in claims 19-24, based on Examples presented in the specification, and would consider an amendment to incorporate one or more of these limitations into a base independent claim if the Examiner feels that amendment would move the application into condition for allowance.

In several of the previous Responses, Applicants have provided detailed calculations of how values for PAA and SBR in the claimed invention are not equivalent to the values used in Yoshino. Calculating back and forth between the two sets of units is not difficult, but it is a mathematical exercise that takes some time. In the most recent response, Applicants provided a calculation of Example 17 from Yoshino, using that data to demonstrate that how the calculation can be performed, and then provided a Table for correlating the claimed values to the units used in Yoshino. Those calculations were intend to emphasize why Yoshino and the claimed invention are different across all the disclosed ranges, and to provide a template to help the Examiner understand why the values are so different.

In the Response to Arguments, Examiner has asserted that "Applicants conveniently used only the solids part of SBR and not the latex as a whole," implying that the calculation somehow favors the Applicants' position. Applicants assert that this position by the Examiner regarding Applicants' position is incorrect. In fact, the Examiner's position on solids weight versus latex weight further emphasizes why Yoshino is not the same as the claimed invention.

Applicants used the dry weight instead of the latex value from Example because this number represents the most broadly construed interpretation. In other words, the dry weight position gives results that are in fact less favorable to the Applicant. Calculating the latex value in fact further strengthens Applicants assertion. Returning to Example 17 on Page 8 of Response filed August 4, 2008, the Applicants present calculations for the ratios based on solids and based on latex values. In other words, if instead of using 5 parts for the solid SBR, the calculation uses 10 parts latex SBR, then the results of Example 17 are:

Calculation Type	Using 5 parts solid SBR (Previous Calculation)	Using 10 parts latex SBR (Examiner's Suggested value)
Yoshino pbw SBR	5 pbw	10 pbw
Sony weight % SBR	4.7 weight %	**9.1 weight %**
Yoshino pbw thickener	20 pbw per 100 parts SBR	10 pbw per 100 parts SBR
Sony weight % thickener	0.94 weight % v total binder	0.90 weight % v. total binder.

As can be seen, using the value of SBR latex, based on water and solids, the values in Yoshino produces data that is even further removed from the Applicant's claimed values. Applicant claims about 2 weight percent to about 4 weight % SBR in claims 1 and 9, yet the previous calculation based on solids value gave 4.7 weight % SBR. And the value based on latex which the Examiner asserts Applicants conveniently disregarded is even further removed, at 9.1 weight % SBR. Based on this demonstration, Applicants reiterate that Example 17 was presented for demonstration purposes, and that Table 1 in the previous office action was presented based on the least favorable interpretation of the data.

A prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient for prima facie obviousness rejection, but if a reference's disclosed range is so broad as to encompass a very large number of distinct compositions, the narrower range may be

patentable over the broader range. MPEP §§2144.05, 2144.08. In this instance, independent claims 1 and 9 require 5-12% carbon, 2-4 wt% binder, and 0.5-2% weight thickener. In terms of Yoshino, the thickener values are 12.5-125 pbw thickener per 100 pbw binder, and dependent claims 19 and 24 further limit the thickener values to 25-125 pbw per 100 pbw binder. A table setting forth the claim limitations and values from Yoshino is presented below. The values are in the pbw format used by Yoshino.

	Claimed invention	**Yoshino**
Binder	Approx. 2 to 4 pbw	0.1-20 0.5-10 preferred
Thickener Claims 1, 9 Claims 19, 24	 12.5-125 pbw 25-125 pbw	 2-60 pbw
Carbon material	5-12 wt %	Single example 4.7% No range presented

As asserted by the Applicant, the values of the prior art simply fail to encompass the claimed ranges for carbon material. For this reason alone, the rejection based on Yoshino should be withdrawn.

Yoshino also fails to make obvious the amount of thickener present in the claimed invention. As Applicants have noted, the disclosed range in Yoshino for binder is so broad as to encompass a very large number of possible distinct compositions. Applicants have demonstrated that these values fail to work for compositions outside the claimed range. Examples 1-1, 1-2, 2-1 and 2-2 prepare cathodes with a cathode active material of olivinic $LiFePO_4$ containing 10% carbon, and a compositions of 98:2:1, 97.5:2:0.5, 96:4:1, and 95.5:2:2.5 of cathodic active:SBR:PBR. Compositions containing 99:1:1, 99:5:1, and 97.7:2:0.3, ranges that Yoshino predict would work, fail. Note that the measurements in Examples 1 and 2 demonstrate a results effective variable peel strength and are not qualitative determinations, but represent quantitative

measurements of peel strength as discussed on page 15, first paragraph, wherein the peel strength is defined as "Strong" for binding forces of 7 gf/mm and above, "Sufficient" for 2-7 gf/mm, and "Insufficient" for less 2 gf/mm.

In summary, the Yoshino reference does not disclose carbon in the anode from 5-12 weight percent, and fails to predict the narrow range of SBR and PAA necessary to prepare cathodes of effective compositions. For that reason, independent claims 1 and 9 are non-obvious in view of the combination of Yoshino with Yamada. Furthermore, Applicants respectfully assert that dependent claims 19-24, drawn to specifically disclosed experimental embodiments of the claimed invention, are further distinct and non-obvious over the Yoshino. Measurements conducted by the Applicants demonstrate that values predicted by the Yoshino fail to succeed for the claimed invention using olivinic $LiFePO_4$ with carbon, SBR, and PAA. For these reasons, Applicants assert that claimed invention is novel and nonobvious, and respectfully request that the rejections be withdrawn.

Respectfully submitted,

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